

# Standard Results Reporting for the Laboratory Response Network

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# Overview

- Introduction
- Priority Needs for LRN Results Reporting
- Current Solution
- Standards Implemented
- LRN Results Messenger Version 2
- Questions



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# Introduction

- Standard results reporting is in place in the Laboratory Response Network (LRN) to a limited extent
- LRN labs supporting the BioWatch program have had a reporting solution in place since the program began in 2003
- Over 132,000 results messages have been exchanged



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# Priority Needs for LRN Results Reporting

- LRN results available for improved surveillance, decision making, and response management
- Equip LRN labs with the capability to manage and share laboratory data in a secure and standard way in real time
- Strengthen preparedness by enabling two-way electronic data exchange:
  - ◆ Lab to lab
  - ◆ Between a lab and its partners



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# Priority Needs for LRN Results Reporting

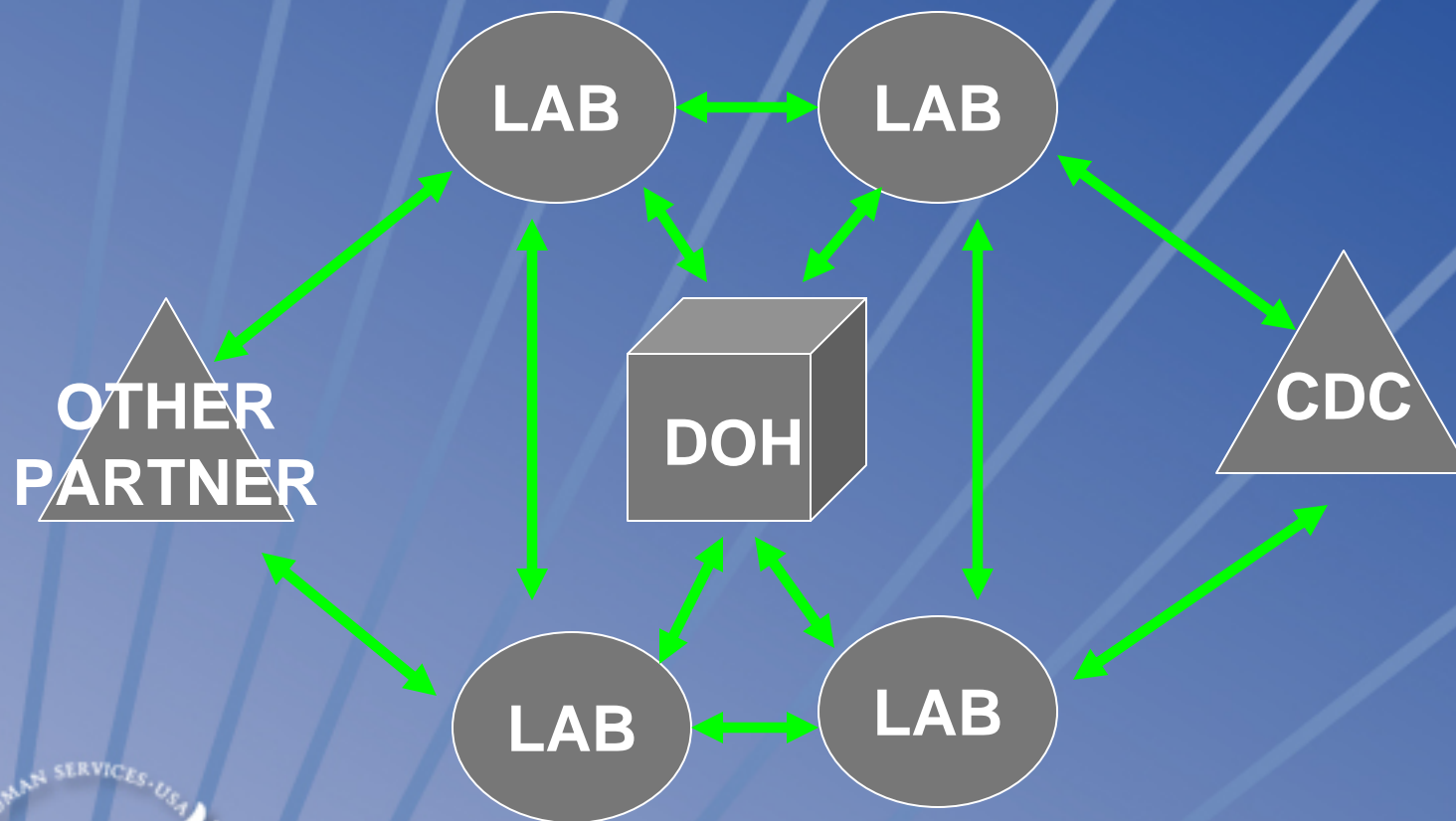
- Promote data sharing with partners by using standards
- User-friendly environment that minimizes “learning curve” problems during an emergency
- Provide standards and assistance so that labs are encouraged to use their own LIMS to exchange information with partners in an automated way



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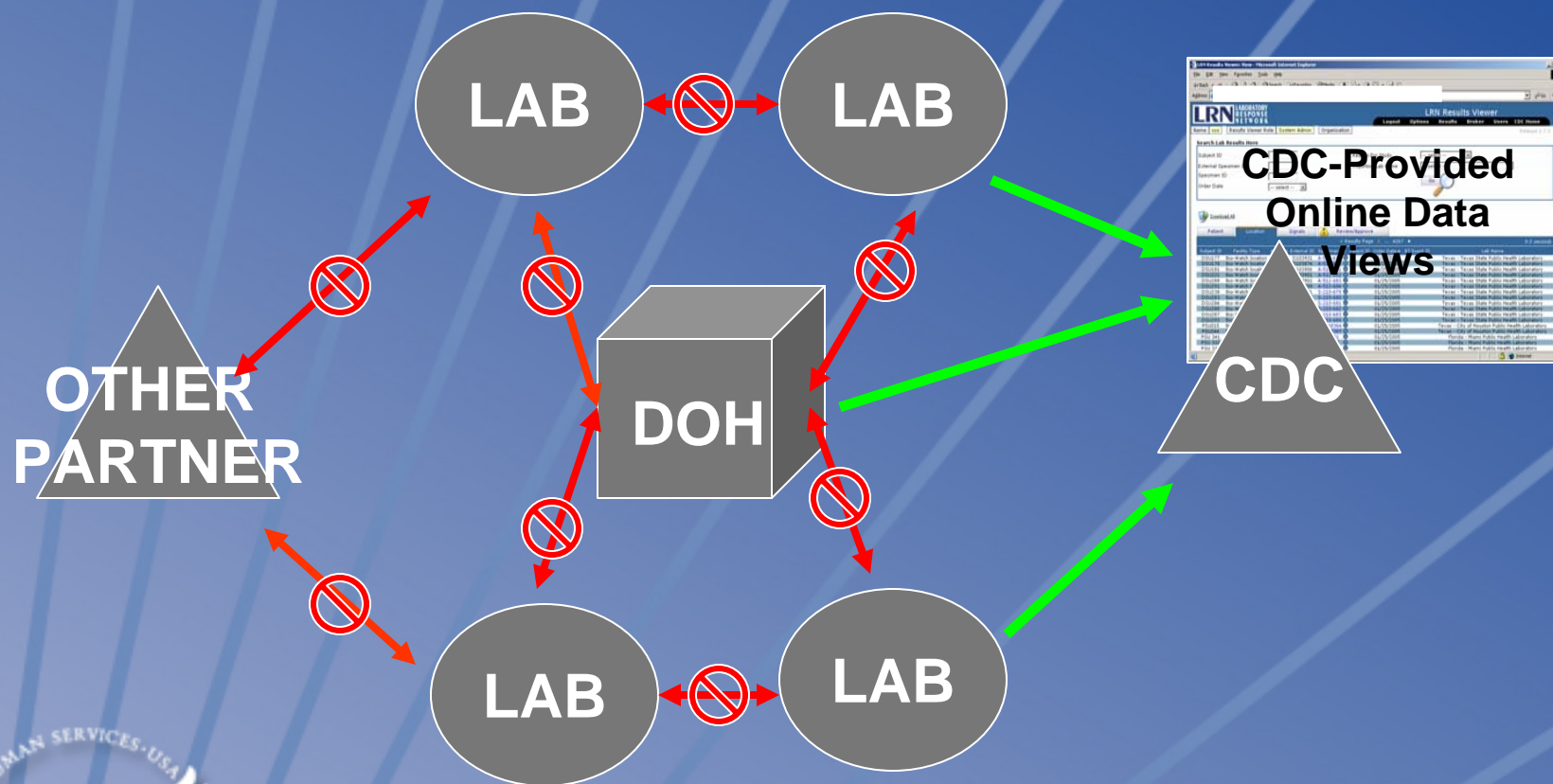
# Goal: Complete Interconnectivity for the LRN



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# Current Solution



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# Current Solution

- LRN Results Messenger, Version 1.x
- Paired with the PHIN Messaging System (PHIN MS)
- Results can be viewed securely online using the LRN Results Viewer available through the LRN website



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# PHIN MS

- ebXML-based data exchange component
- Places HL7 message in an ebXML wrapper, and encrypts and transports message
- Queue-based processing at both ends
- SSL internet connection to CDC's Secure Data Network
- PKI encryption of each message



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# LRN Results Messenger, Version 1

- User enters data and the application creates an HL7 lab results message that is dropped in the local PHIN MS queue
- Contains information to capture results for all LRN biological assays, not just BioWatch
- Visual Basic user interface
- Microsoft Access Database
- Not a client-server implementation
- Only one person at a time can enter data



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**LRN Result Messenger**

File Search Subjects Send Messages Setup Pending Lab Results Help

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Location Specimen Info Ordered Test Test Results

Specimen Id Parent Id Type

☐ 1234 Air Sample

Specimen ID 1234

Specimen Parent ID

Placer Order Number

\* Filler Order Number 1234-BAconfirm2

Parent Number

\* Order Date 12/ 8 /2004

\* Order Time 01:42 PM

Lab Tech

\* Reason For Study

Bio-Watch

\* Suspect Agent

Bio Watch

\* Test Code

Biowatch Screen Panel 1

Reason for Study Description

Order Notes

**Save Order** Delete Order New Order

Placer Order Number	Filler Order Number	Specimen ID	Test Code
<input type="checkbox"/>	1234-BAconfirm2	1234	Biowatch Screen Panel 1
<input type="checkbox"/>	1234-BAconf	1234	Real-time PCR (B. anthracis)
<input type="checkbox"/>	1234-conf	1234	Real-time PCR
<input type="checkbox"/>	1234-1	1234	Biowatch Screen Panel 1

Ordering Facility

Name

Address

City

State Zip

Phone

Ordering Physician / Response Team

Provider ID

ID Type

Last Name

First Name

Address

City

State Zip

Phone



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# LRN Results Messenger History

- Development began October 2002 as a basic reporting tool for the LRN
- Development quickly stepped up to meet needs of BioWatch
- Deployed beginning April 2003
- Key updates completed summer 2003 to ease data entry
- Deployments to new labs completed ad hoc



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# Standards Implemented in LRN Results Messenger

- Health Level 7 (HL7) – Data exchange standard specifying message structure and vocabulary
  - ◆ ORU\_R01 specification for Bioterrorism Laboratory Results Message implemented in HL7 version 2.4z
  - ◆ Pipe- and carat-delimited file is translated to XML for validation and processing at CDC and pushed into a SQL Server database



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# Standards Implemented in LRN Results Messenger

- Logical Observation Identifiers Names and Codes (LOINC) – Terminology to describe laboratory observations
- Systemized Nomenclature of Medicine (SNOMED) -- common language that enables a consistent way of capturing, sharing and aggregating health data across specialties and sites of care
- Public Key Infrastructure (PKI) – message encryption and sender authentication



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# LRN Results Messenger Version 2

- Completely replaces Version 1, not simply an upgrade
- Lightweight system for laboratory data management
- Does not have the functionality of a full LIMS product
- Short-term *preparedness* solution
- Available to the LRN beginning September 2005
- Many improvements are based on feedback from BioWatch laboratory users of Version 1



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# Implementation Details

- Embodies PHIN standards for messaging
- Web application composed of J2EE components (Java 2 Platform, Enterprise Edition) relying on servlet APIs
- Distributed application that runs locally at the lab -- behaves like a website hosted internally
- Install includes web application, JBoss application server, Hypersonic SQL DBMS, and PHIN MS client



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# Improvements Underway

- Easier use, install, and configure
- Data entry for large sample loads
- Multi-user data entry
- Supports reporting for proficiency testing (PT)
- Automatic update mechanism for adding new terminology, message specifications, or functionality
- Will enable results exchange with any partner that has a message receiver, not just CDC



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# Messages Supported

- Supports HL7 v 2.5
- Laboratory Order Request – OML\_O21
- Laboratory Order Response – OMF\_O22
- Public Health Laboratory Test Result – OUL\_R22
- Other messages authored strictly for this application – User Feedback, Application Update, Application Status



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[My Jobs Selector](#)

[Job Management](#)

[Add](#)

myjob1  
myjob2

[Edit](#)  
[Delete](#)

[Assign](#)

\* assigns selected job to selected user.

[Messaging Console](#)

[Search for Items](#)

## Welcome

Welcome to Mustang



### Actions



### Shipment Selector

[Edit Shipment](#)

[Delete This](#)

[Create CoC](#)

LRN RM V2 - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://localhost:8080/mustang/landing.form

LRN RM V2 - Microsoft Internet Explorer

Enter a Shipment

Internal Tracking #5

Shipper: CDC Atlanta

Contact: Dr. Wise

Address: Atlanta GA 30033

Suspect Agent: (L-1320A) brucella species

Phone #:

Fax #:

Departure: 05/04/2005 04:05 PM

Received: 05/05/2005 04:05 PM

Courier: FedEx

Tracking #: 12344-90P-927

Received By: Tech. Joe Gidds

Bio Safety Level: (Level 2) Level 2

Risk Code: (BIO) Biological

Handling Code: (AMB) Ambient Temperature

Condition: (CLOT) Clotted

Description:

New Save Delete Close

Enter Sample(s) Create CoC Form

Reports Admin Feedback Help CDC


Thursday, May 5, 2005

Sample Test

Edit Shipment Delete This Create CoC

Done




 [My Jobs Selector](#) Job Management  Add





No Jobs

 Edit  
 Delete Choose User...  Assign

\* assigns selected job to selected user.

 [Messaging Console](#) [Search for Items](#)☒ Single Mode ☐ Batch Mode

Sample ID	ID Source	Display in Job Pane	Delete
Example Sample ID	Example ID Source		

Sample ID  ID Source   [Add to Above List](#)  
Program  Choose Program**Sample Information**Category  Choose Category  
Type  Choose Type  
Suspect Agent  Choose Suspect Agent  
Subject  Choose Subject    
Sample Collected    
Storage Location   
Description **Shipment Information**Shipment  Choose Shipment   
Condition  Choose Sample Condition  
Sample Recieved  05/05/2005 04:43 PM   
Bio Safety Level  Choose Biosafety Level  
Handling Code  Choose Handling Code  
Risk Code  Choose Risk Code

New Sample



Clear This Form



Delete This Item



Save This Now

No Jobs

Choose User...

\* assigns selected job to selected user.

Messaging Console

Search for Items



## LRN Results Messenger Help

### Page Comments

### Page Ratings

Content	Design	Usability	Overall
<input type="radio"/> ++	<input type="radio"/> ++	<input type="radio"/> ++	<input type="radio"/> ++
<input type="radio"/> +	<input type="radio"/> +	<input type="radio"/> +	<input type="radio"/> +
<input type="radio"/> -	<input type="radio"/> -	<input type="radio"/> -	<input type="radio"/> -
<input type="radio"/> --	<input type="radio"/> --	<input type="radio"/> --	<input type="radio"/> --

Submit Feedback

Display in Job Pane

Delete

Add to Above List

Subject

Choose Subject

Sample Collected

Storage Location

Description

### Shipment Information

Shipment

Choose Shipment

Condition

Choose Sample Condition

Sample Received

05/05/2005 04:43 PM

Bio Safety Level

Choose Biosafety Level

Handling Code

Choose Handling Code

Risk Code

Choose Risk Code



New Sample



Clear This Form



Delete This Item



Save This Now

# System Requirements

- Java-compatible OS
- Minimum 128MB of memory
- Pentium 250 Mhz processor
- Browser must support CSS2 and must have Javascripts and cookies enabled:
  - ◆ Internet Explorer 5.5 or higher
  - ◆ Netscape 6 or higher
  - ◆ Mozilla 1.0 or higher
  - ◆ Opera 5 or higher



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# Supported Databases Management Systems

- Users have a choice of the implementation of the database layer of the system
  - ◆ Hypersonic SQL – default and embedded with initial install
  - ◆ MySQL – free but will require separate install and administration
  - ◆ Microsoft SQL Server – requires separate purchase and install and administration



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# Questions



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Release 1.7.3

Subject ID

External Specimen ID

Specimen ID

Order Date

Reason For Study -- select --

Reporting Lab Name -- select --

Go

[Download All](#)

Patient

Location

## Signals



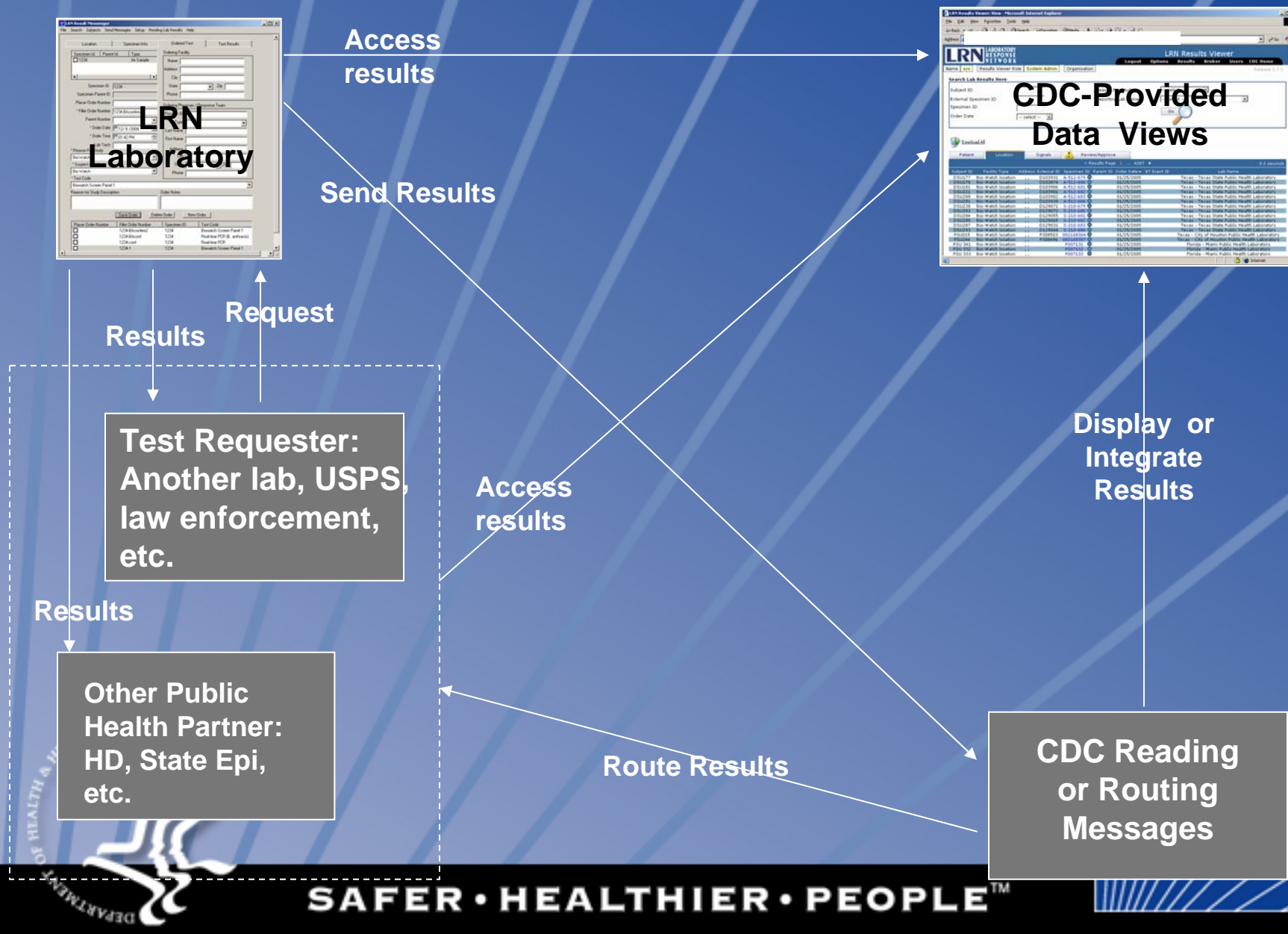
Review/Approve

◀ Results Page 1 ... 4267 ▶

9.5 seconds

Subject ID	Facility Type	Address	External ID	Specimen ID	Parent ID	Order Date▼	BT Event ID	Lab Name
------------	---------------	---------	-------------	-------------	-----------	-------------	-------------	----------

# Event Information Flow



# What do we mean when we say “message?”

- “Message” refers to the packet of data that is sent to a partner electronically
- LRN Results Messenger creates laboratory results messages utilizing the HL7 standard
- Currently those messages include data about BioWatch samples, tests run on those samples, and the results of those tests
- Messages are received and “parsed” (read and understood) at CDC and placed into a database
- In the future, a message may contain many things, including an order for a laboratory test
- The structure of messages is standard – which means partners can build software to create or parse messages



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# Why are standard terminology and messages important?

- Provide “templates” so that...
- A lab can equip its own LIMS to send standard messages to partners
- Partners can also build software to create or parse messages



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# Why is a standard terminology important?

- Without standard terminology, a user might enter *Coxiella burnetii* results various ways:
  - ◆ “C. burnetii ”
  - ◆ “Cox. burn.”
  - ◆ “Coxiella burnetii ”
  - ◆ ...and various misspellings...
- Extra human effort is needed to compile results coming from different places
- With information standards, all parties agree to refer to *Coxiella burnetii* in the same way



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# Why is the LRN Results Messenger better than an online reporting tool?

- First step toward full interconnectivity for labs
- Movement toward LIMS integration that will eliminate double data entry
- Secure – interoperates with CDC's Secure Data Network
- Utilizes standards that facilitate data sharing
- Fulfills many PHIN Preparedness Requirements for Connecting Laboratory Systems (CLS)



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